REPORT ON AN AMBIENT AIR SURVEY IN GUELPH AND KITCHENER

MAY 1978

REPORT No. ARB-TDA 46-80

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Ministry of the Environment

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Minister

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Deputy Minister

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AIR RESOURCES BRANCH

TECHNOLOGY DEVELOPMENT AND APPRAISAL SECTION

MONITORING AND INSTRUMENTATION DEVELOPMENT UNIT

Report No. ARB-TDA 46-80

REPORT ON AN AMBIENT AIR SURVEY

IN

GUELPH AND KITCHENER

May 1978

Ontario Minsitry of the Environment
880 Bay Street
Toronto, Ontario
M5S 1Z8

June 1980

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01 Summary

Two, single day ambient air monitoring surveys were undertaken by the Monitoring and Instrumentation Development Unit of the Air Resources Branch during May, 1978. The first survey was in Guelph on May 3rd and the second was in Kitchener on May 4th. The main aim of these two surveys was to establish ground level concentrations of several selected atmospheric contaminants in the downtown sectors and, if possible, comment on vehicular contribution.

A high pressure ridge dominated the weather pattern in this area and brought light, northerly winds on May 3rd followed by a nocturnal inversion and light easterly winds on May 4th.

Owing to the brevity of these surveys, only a single monitoring site was chosen in each city.

At the corner of Wyndham and MacDonnell Sts., Guelph, significant ground level concentrations of carbon monoxide were recorded. The maximum instantaneous and one-hour average ground level concentrations of carbon monoxide were 49 parts per million by volume (ppm) and 8.5 ppm (approximately 28% of the desirable ambient air quality Criterion) respectively. These elevated ground level concentrations of carbon monoxide were directly attributed to the buildup of the nocturnal inversion and the morning rush-hour traffic. The wind/concentration rose analyses for carbon monoxide directly aligned the areas of maximum contribution along the major traffic routes in this city.

Elevated ground level concentrations of nitrogen oxides were also recorded in Guelph. The maximum instantaneous and one-hour average ground level concentrations of nitrogen oxides were 0.89 ppm and 0.45 ppm (more than twice the desirable ambient air quality Criterion) respectively. The excursion above the Criterion for nitrogen oxides lasted for approximately 5 hours - approximately 25% of the monitored data/time. Correlation analyses between the ground level concentrations of nitrogen monoxide and carbon monoxide depicted no

mutual origin. For 19 degrees of freedom, the correlation coefficient was 0.08 and therefore was deemed to be insignificant. A secondary source (apart from vehicular traffic) was considered to have contributed to these elevated concentrations of nitrogen oxides - the most plausible being long range mass transport.

Slightly increased concentrations of total hydrocarbons were recorded in Guelph during this survey. The maximum instantaneous and one-hour average ground level concentrations of total hydrocarbons were 9 ppm and 3.4 ppm respectively. THC concentration levels indicative of many rural environments throughout the Province are between 1 to 2 ppm. No source delineations could be made with respect to this contaminant.

At the corner of Duke and Scott Streets, significant ground level concentrations of carbon monoxide were recorded in Kitchener. The maximum instantaneous and one-hour average ground level concentrations of carbon monoxide were 85 parts per million by volume (ppm) and 17.5 ppm (approximately 60% of the desirable ambient air quality Criterion) respectively. The wind/concentration rose analyses directly pointed to the Duke/Scott intersection as being the major source of carbon monoxide. In addition, the concentration/time analyses denoted a gradual build-up of carbon monoxide after 1700 hours - coinciding with the increased commercial, night-time traffic.

Low ground level concentrations of nitrogen oxides and total hydrocarbons were recorded at this monitoring site. The maximum one-hour average ground level concentrations of nitrogen oxides and total hydrocarbons were 0.1 ppm (approximately 35% of the desirable ambient air quality Criterion) and 2.2 ppm respectively.

Albeit the following atmospheric contaminants were not discussed in this report due to their extremely low ground level concentrations, a data bank for hydrogen sulphide and sulphur dioxide was initiated for these two surveys.

In order to truly assess the environmental impact of vehicular traffic in the downtown sectors of Guelph and Kitchener, a much more detailed ambient air survey programme would be required. This report discusses the findings of essentially a spot check of an exploratory nature in order to assess the feasibility of such a programme.

02 Introduction

As requested by the West Central Region, the Monitoring and Instrument Development Unit of the Air Resources Branch conducted two short ambient air quality surveys in the cities of Kitchener and Guelph during May of 1978.

Although these surveys only lasted for one day in each city, the main purpose was to establish and assess ground level concentrations of various contaminants in the downtown/commercial sectors and to (in general) comment on the vehicular contribution.

03 Survey Technique

One mobile air monitoring (MAM) unit, a 1975 GMC Transmode, was utilized to monitor the air quality in the downtown areas of Guelph and Kitchener. The MAM unit had permanently installed analyzers for monitoring sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), hydrogen sulfide (H_2S), total hydrocarbons (THC), methane (CH_4), and oxides of nitrogen (NO_x). Instruments to collect meteorological data (wind speed, wind direction, barometric pressure, temperature, relative humidity and solar radiation) were also incorporated into the system.

The MAM unit is equipped with an automated data acquisition system (Hewlett Packard 9830A mini-computer system) and two electric generators (Onan 6 KW). Automated, independent and continuous monitoring capabilities were a major feature of this unit. The HP 9830A mini-computer system performed initial data analyses in the field (re: accuracy and validity) but the final data reduction and analyses were carried out by a larger system located within the Air Resources Branch at 880 Bay Street, Toronto.

Following an assessment of wind direction and wind speed and other pertinent meteorological conditions and in conjunction with visual and olfactory observations, the locations of maximum ground level concentrations were found and ambient air monitoring was initiated within these areas.

04 Monitoring Technique

(i)Sample Collection (MAM Unit)

Gaseous ambient air samples were taken at a constant flow rate (approximately 0.2 m^3/min) by a probe located on the van and whose orifice was located approximately 5 m above ground level. Air samples entered a manifold from which a short teflon sampling line was connected to each analytical instrument. This arrangement ensured little or no sample degradation, minimal response time, and minimal sample contamination due to ground level sources (e.g., entrained soil, vehicular traffic, etc.).

(ii)Instrumentation - Analyzers

The instrumentation associated with the MAM unit is presented in Table #1, on page 9.

(iii)Meteorological Analyses

Meteorological conditions were monitored on a continuous basis by the instrumentation associated with the MAM unit (refer to Table #1, page 9). Complementing this microscale monitoring, macroscale information regarding air mass movements and prognostics was obtained from Environment Canada, Ottawa.

(iv) Calibration - Analyzers

Analyzers and sources were calibrated before the survey. During the survey, the analyzers' calibration was checked at least once every day utilizing the built in sources and electronic circuitry. All monitors were found to be extremely stable and the calibration remained within the prescribed limits throughout the duration of the survey. Following completion of the survey, all instruments were rechecked in the laboratory and all calibration statistics were found to be satisfactory.

Table 1: INSTRUMENTATION - GMC

Instrument	Manufacturer	Analytical Technique	Maximum Sensitivity (Full Scale)
H_2S Source	Hartmann & Braun (H&B Prüfgasgenerator)	N/A	N/A
H_2S Analyzer	H&B Picos	electrochemical	0.05 ppm
SO_2 Source	H&B Prüfgasgenerator	N/A	N/A
SO_2 Analyzer	H&B Picoflux 2	conductometric	0.3 ppm
O_3 Analyzer/Source	Bendix 8002	chemiluminescent	0.05 ppm
NO_x, NO_2, NO Analyzer	Bendix 8101-B	chemiluminescent	0.5 ppm
CO Analyzer	H&B Uras 2T	Infrared Absorption	50 ppm
THC, CH_4, THC-CH_4 Analyzer	Ingenieur - Produktions-Gruppe München (IPM) RS-t	Dual flame ionization detector	50 ppm THC (as CH_4)
Hg Analyzer	Scintrex HGP-2	Ultra-violet Absorption	200 ng/m^3
CO, THC, THC-CH_4, CH_4 source	Matheson	compressed gas	N/A

Instrument	Manufacturer	Scale
**Wind speed	Lambrecht gmBH	km/hr
**Wind Direction	Lambrecht gmBH	degrees
Temperature	Weather Measure (WM) T621	^oC
Relative humidity	WM-HM-11P	percent
Barometric pressure	WM-BM70-B242	millibars
Solar radiation	WM Star Pyranometer	watts/cm^2

** These wind indicators are located on top of a 10-metre retractable mast.

05 Monitoring Site Locations

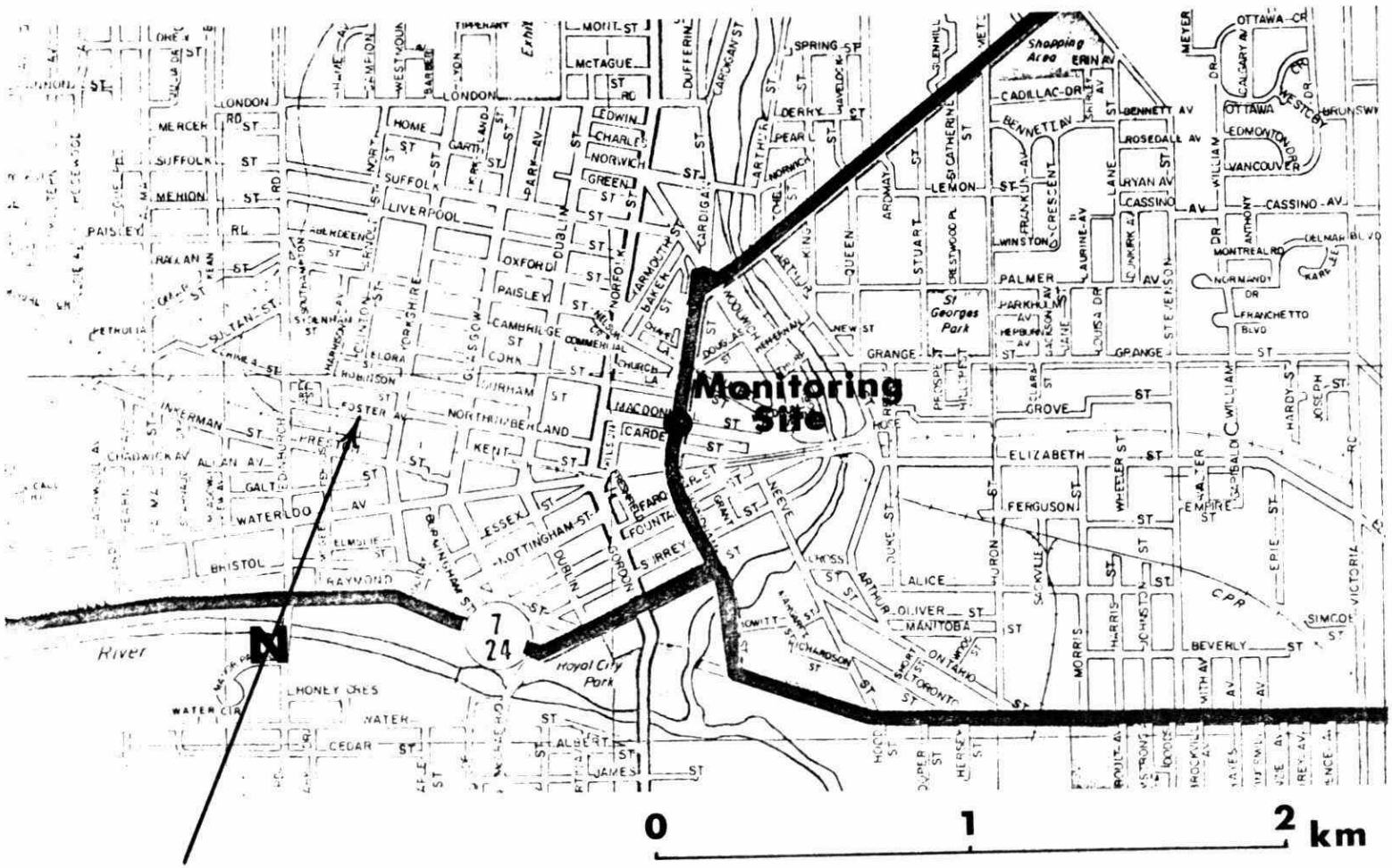
The ambient air monitoring sites are shown in Maps #1 and #2 on pages 11 and 12 and are listed below in Table #2.

Table 2:

Guelph #1	May 3, 1978	Wyndham and MacDonnell Streets
Kitchener #1	May 4, 1978	Duke and Scott Streets

MOBILE AIR MONITORING

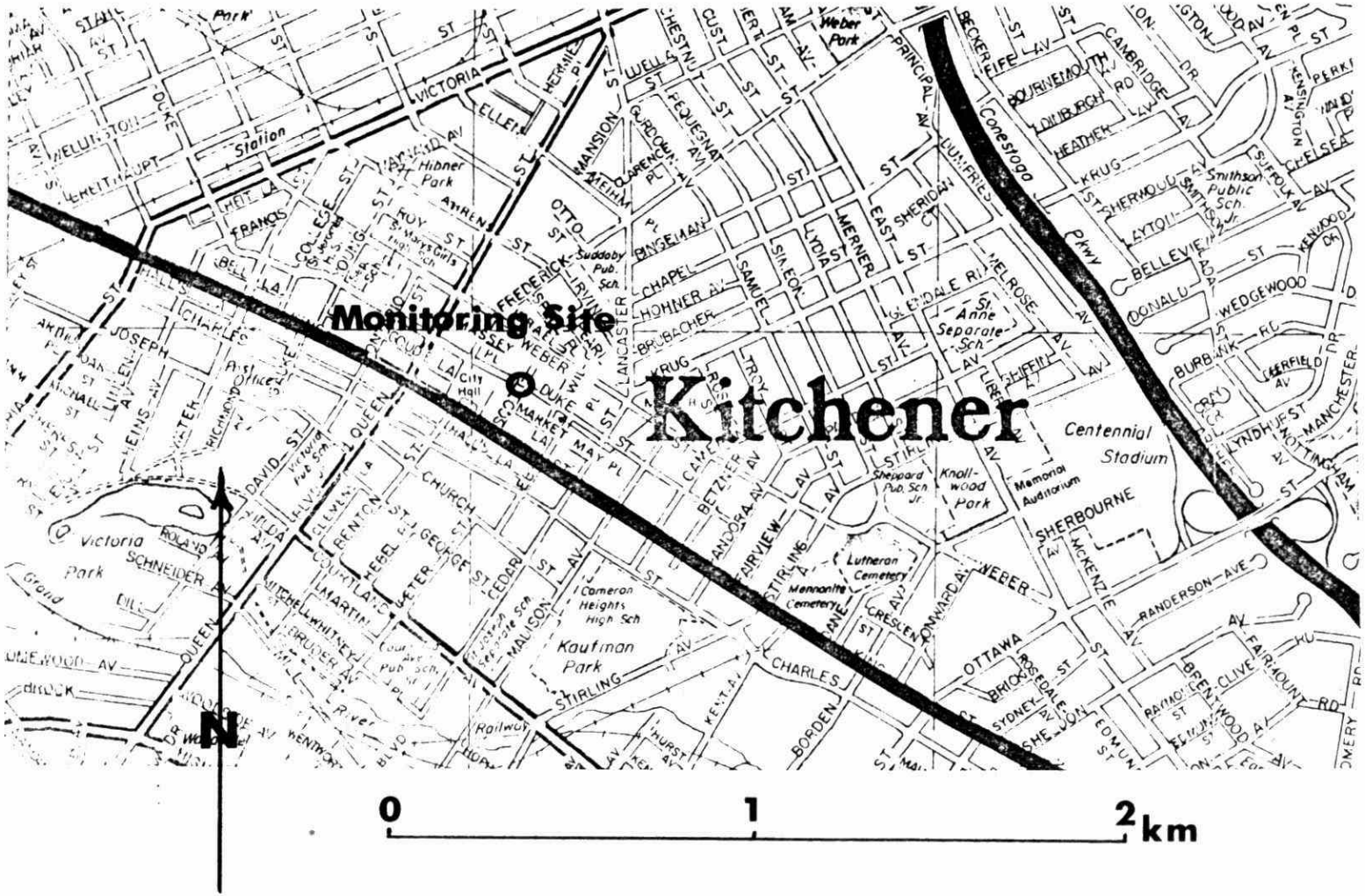
1978 SURVEY ; GUELPH



Map #1

MOBILE AIR MONITORING

1978 SURVEY



Map #2

06 Results

Definition of Terms:

Scanning Time:	Time interval for averaging and data logging of instantaneous interrogations of the analytical instruments by the Data Acquisition System.
Time:	Time of first and final scans used to determine running averages.
Number of Readings:	Number of Scans
MAM:	Mobile Air Monitoring
glc	Ground level concentration

All statistical values are based on 90-second averages of instantaneous interrogations of the analytical instruments and all results are expressed in parts per million (ppm). An example of the processed data format incorporated in this survey is presented in Table 2, page 14.

The concentration/time graphs depicted in this report represent running 60-minute average glc's of a specified pollutant which were acquired during the 90-second scan time interval.

The rose analyses depicted in this report represent 60-minute average glc directional analyses of a specified pollutant and a frequency directional analyses of the prevailing wind.

Table #2

Processed Data Format

(Further analyses are presented at the end of this report.)

KITCHENER #1

DATE: MAY 4 1978
SCAN TIME: 90 SEC
AVERAGING TIME: 60 MIN
LOCATION: DUKE ST. & SCOTT ST. - EATON'S SQUARE & FARMERS' MARKET

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
13:50----14:50	2.3E+00 8.8E-01 4.5E-02 972	1.3E-02 1.1E+00 4.6E-02 10	2.0E+00 6.8E-02 9 88	8.9E-03 3.2E-02 27
14:05----15:05	3.2E+00 8.2E-01 4.7E-02 972	6.9E-03 1.1E+00 4.4E-02 11	1.8E+00 6.8E-02 9 88	6.7E-03 3.2E-02 27
14:20----15:20	3.5E+00 8.3E-01 4.9E-02 972	2.3E-03 1.1E+00 4.2E-02 11	1.8E+00 7.7E-02 9 90	6.1E-03 4.0E-02 27
14:35----15:35	3.9E+00 8.1E-01 4.3E-02 971	8.8E-04 1.1E+00 4.0E-02 11	1.8E+00 8.4E-02 9 90	6.0E-03 4.7E-02 27
14:50----15:50	3.9E+00 7.7E-01 4.4E-02 971	3.6E-04 1.2E+00 3.8E-02 12	1.8E+00 8.6E-02 9 89	6.6E-03 4.8E-02 27
15:05----16:05	3.9E+00 7.5E-01 4.6E-02 971	1.8E-04 1.2E+00 3.7E-02 12	1.9E+00 8.5E-02 9 89	8.9E-03 4.4E-02 28
15:20----16:20	4.0E+00 7.1E-01 4.4E-02 971	2.4E-04 1.2E+00 3.5E-02 13	1.9E+00 8.0E-02 9 89	1.4E-02 4.1E-02 28

07 Discussion

Continental Arctic air was pushing south into Ontario during this two day survey period. A high pressure ridge dominated the weather pattern and brought light, northerly winds on May 3rd and light, easterly winds on May 4th. Ten to eleven hours of sunlight were recorded on May 3rd. As a result of a nocturnal inversion during the night of May 3rd and early morning of May 4th, only eight hours of sunlight were recorded on May 4th. In general, daytime meteorological conditions were conducive to good atmospheric dispersion conditions whereas the night time meteorological conditions induced some trapping of low level emissions.

As mentioned in Section 03, Survey Technique, analyzers for monitoring CO, SO_2, O_3, H_2S, THC, Hg and NO_x were installed in the MAM unit. However only CO, THC and NO_x will be presented in this discussion since these are the major contaminants suspected to have originated from vehicular sources. H_2S and SO_2 are presented in the data printouts for the sake of completeness and the formation of a data bank for future reference. These two contaminants indicated only background ground level concentrations similar to many other areas in Ontario. The mercury and ozone analyzers were inoperative during this survey.

The desirable ambient air quality Criteria for the following contaminants as set out in the Ontario Regulation 872/74, S.1 of The Environmental Protection Act (1971) will be discussed/compared in the ensuing discussion.

Contaminant	Criteria (one-hour)
CO	30 ppm (parts per million)
NO_x	0.2 ppm*
THC	**

* Expressed as concentrations of nitrogen dioxide. Nitrogen monoxide (NO) in the presence of ozone (O_3) readily forms nitrogen dioxide (NO_2). Long time integrated samples (usually 24 hours), when analyzed, contain little or no NO because of this conversion feature. Our analyzer distinguishes between NO and NO_2 and collectively denotes them as nitrogen oxides (NO_x). Therefore since our ambient air sampling and analysis is fast (few seconds), in order to conform to the Criterion, NO_x has to be equated to the NO_2 concentration levels.

** At this time of writing, there exists no Criterion or Guideline for total hydrocarbons.

GUELPH

Carbon monoxide (CO), as mentioned earlier, was the most prevalent contaminant of interest in the downtown sector of Guelph. As noted in statistical summary Table #3 on page 21, significant ground-level concentrations (glc's) of CO were recorded at Wyndham and MacDonnell Sts. The maximum instantaneous glc of CO was 49 ppm and the maximum one-hour average glc was 8.5 ppm (approximately 30% of the Criterion). These elevated glc's of CO may be directly attributed to the build-up of a nocturnal inversion and the onset of the morning rush hour traffic - refer to concentration/time analyses in Graph # 1 on page 22.

Nitrogen oxides are indicative of a combustion process and as noted in statistical summary Table #3 on page 21, significant glc's of NO_x were recorded in downtown Guleph. The maximum instantaneous glc's of NO_x was 0.89 ppm and the maximum one-hour average glc was 0.45 ppm (more than twice the Criterion). As can be seen from the concentration/time analyses for this survey (Graph #1, page 22), the NO_x Criterion was exceeded for approximately 5 hours (25% of the time).

Nitrogen monoxide was found to be the major component of NO_x. Ground level concentrations of NO were found to comprise approximately 65% of the total NO_x. The overall average glc's of NO_x and NO for this monitoring period were 0.17 ppm and 0.11 ppm respectively.

Although NO was assumed to be produced from a nearby combustion source and the wind/concentration rose depicted concentrations of NO originating from the major traffic routes (Rose #2 on page 25), correlation analyses between the glc's of NO and CO depicted no mutual origin. For 19 degrees of freedom, the correlation coefficient (0.08) was deemed insignificant (refer to Graph #3, page 26). In addition, monitoring during the nocturnal inversion during the morning of May 4th resulted in little apparent increase in NO or NO_x. Therefore vehicular traffic was not assumed to be the major source but rather long range mass transport.

Vehicular traffic was also assumed to be a source of hydrocarbons. The maximum instantaneous and one-hour average glc's of THC were 9 ppm and 3.4 ppm respectively. Since methane was assumed to be mainly of a biological origin, the non-methane hydrocarbons were investigated. Equal contributions of non-methane and methane comprised the total hydrocarbon glc's. No correlation was found between the glc's of the non-methane hydrocarbons and carbon monoxide. For nineteen degrees of freedom, the correlation coefficient was 0.25, thus insignificant and inferring no mutual source (Graph #4, page 27).

In summary, contaminants from vehicular traffic in downtown Guelph were found to be tolerable. CO was the only major contaminant that may be directly attributed to vehicular traffic. Glc's of nitrogen oxides did exceed the desired air quality Criterion but were suspected to have originated from long range mass transport. Hydrocarbon glc's were significant but could not be solely attributable to vehicular traffic.

KITCHENER

When the MAM unit arrived in Kitchener on May 4th, the fog from the nocturnal inversion had dissipated and strong vertical thermals had been established due to solar heating of the downtown sector. The monitoring site was established at the southwest corner of Scott and Duke Streets and the prevailing winds were easterly and brisk (approximately 10 to 15 km/hr). Essentially good atmospheric dispersion conditions were evident at this time.

Significant ground level concentrations (glc's) of carbon monoxide (CO) were detected at this monitoring site. As noted in the statistical summary table (Table #3 on page 21), the maximum instantaneous and one-hour average glc's of CO were 85 ppm and 17.5 ppm (approximately 60% of the Criterion) respectively. The wind/concentration rose analyses (Rose #3 on page 30) pointed directly to the Duke/Scott intersection as being a major source of CO. In addition, the CO concentration/time analyses as shown in Graph #5 on page 28 denoted a gradual build-up of CO commencing around 1700 hours. After this time, the winds were calmer, the ambient temperature was dropping and the relative humidity was increasing; all indicative of genesis of another nocturnal inversion. Generator failure of the MAM unit prematurely terminated this survey at approximately 2100

hours thus prohibiting confirmation of this atmospheric phenomenon. Nevertheless, the gradual build-up of CO in this downtown sector may be directly attributed to this phenomenon and increased evening shopping/commercial traffic.

Very low glc's of nitrogen oxides (NO_x) and total hydrocarbons (THC) were detected at this monitoring site. As noted in the statistical summary table (Table #3 on page 21), the maximum one-hour average glc's of NO_x and THC were 0.1 ppm (approximately 35% of the Criterion) and 2.2 ppm respectively. These concentrations are considered to be of a background nature only and are indicative of many environments throughout the Province. To further support this statement and as can be seen from the concentration/time analyses in Graphs # 5 and # 6 on pages 28 and 29, no definitive increase in the glc's of these two contaminants was recorded throughout this monitoring period.

As expected, equal contributions to NO_x of nitrogen monoxide (NO) and nitrogen dioxide (NO_2) were observed. Similiarily, THC was found to be composed of equal concentrations of methane (CH_4) and non-methane hydrocarbons (THC-CH_4).

Since the glc's of NO_x and THC were very low, correlation analyses between these two contaminants and CO and wind/concentration analyses for NO_x and THC were deemed ineffectual regarding source(s) delineations.

In summary, vehicular traffic was found to contribute to a significant CO concentration build-up in downtown Kitchener.

08 Appendix

a)	Statistical Summary Table	Table #3
b)	Guelph	
	CO, THC, NO_x concentration/time analyses	Graph #1
	CO, TH-M, NO concentration/time analyses	Graph #2
	CO/Wind rose analyses	Rose #1
	NO/Wind rose analyses	Rose #2
	NO/CO correlation analyses	Graph #3
	TH-M/CO correlation analyses	Graph #4
c)	Kitchener	
	CO, THC, NO_x concentration/time analyses	Graph #5
	CO, TH-M, NO concentration/time analyses	Graph #6
	CO/Wind rose analyses	Rose #3
d)	Statistical Printouts (one-hour averages)	
	Guelph	Page 31
	Kitchener	Page 39

TABLE # 3

AMBIENT AIR SURVEY IN GUELPH & KITCHENER

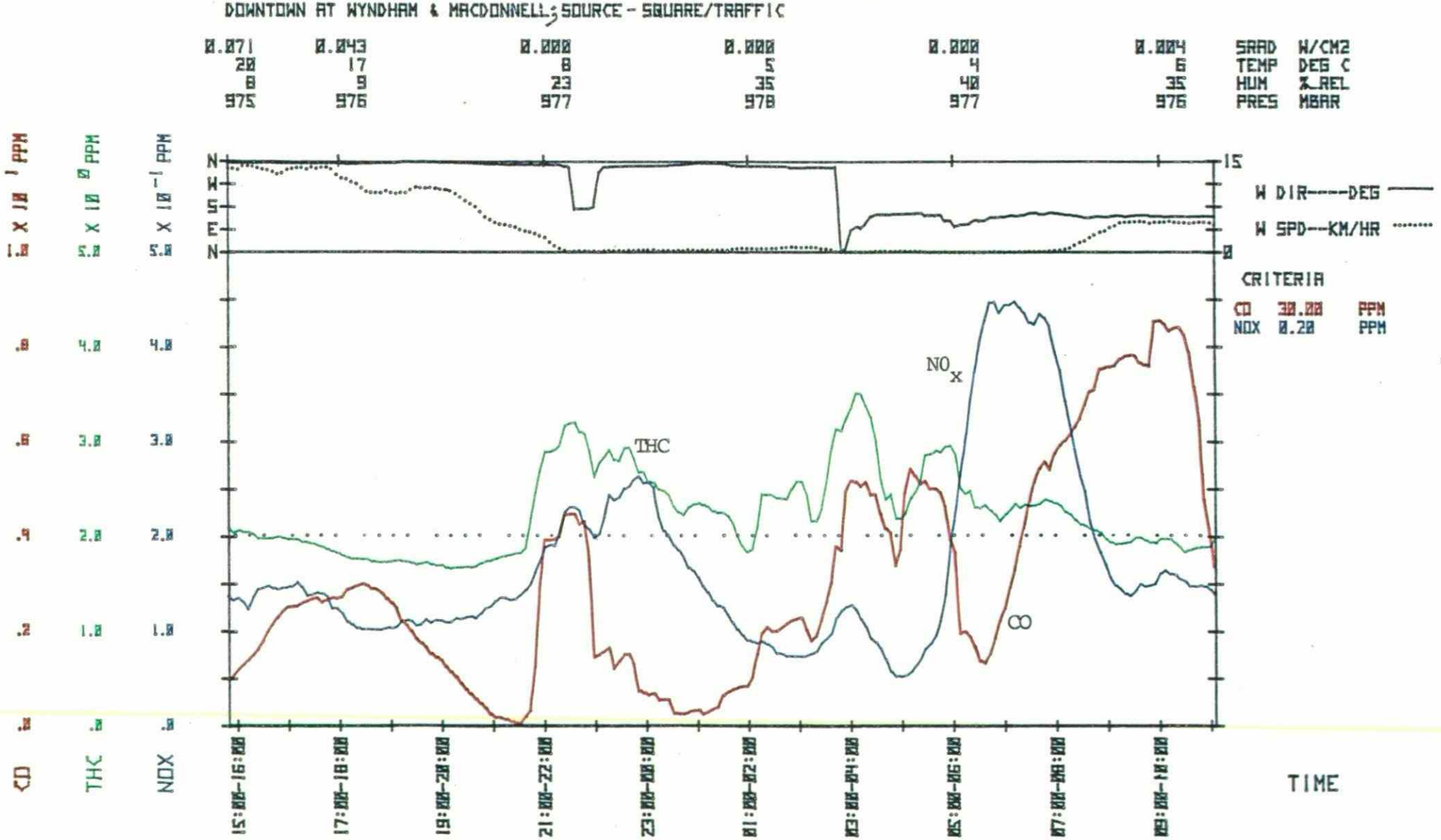
Units - PPM

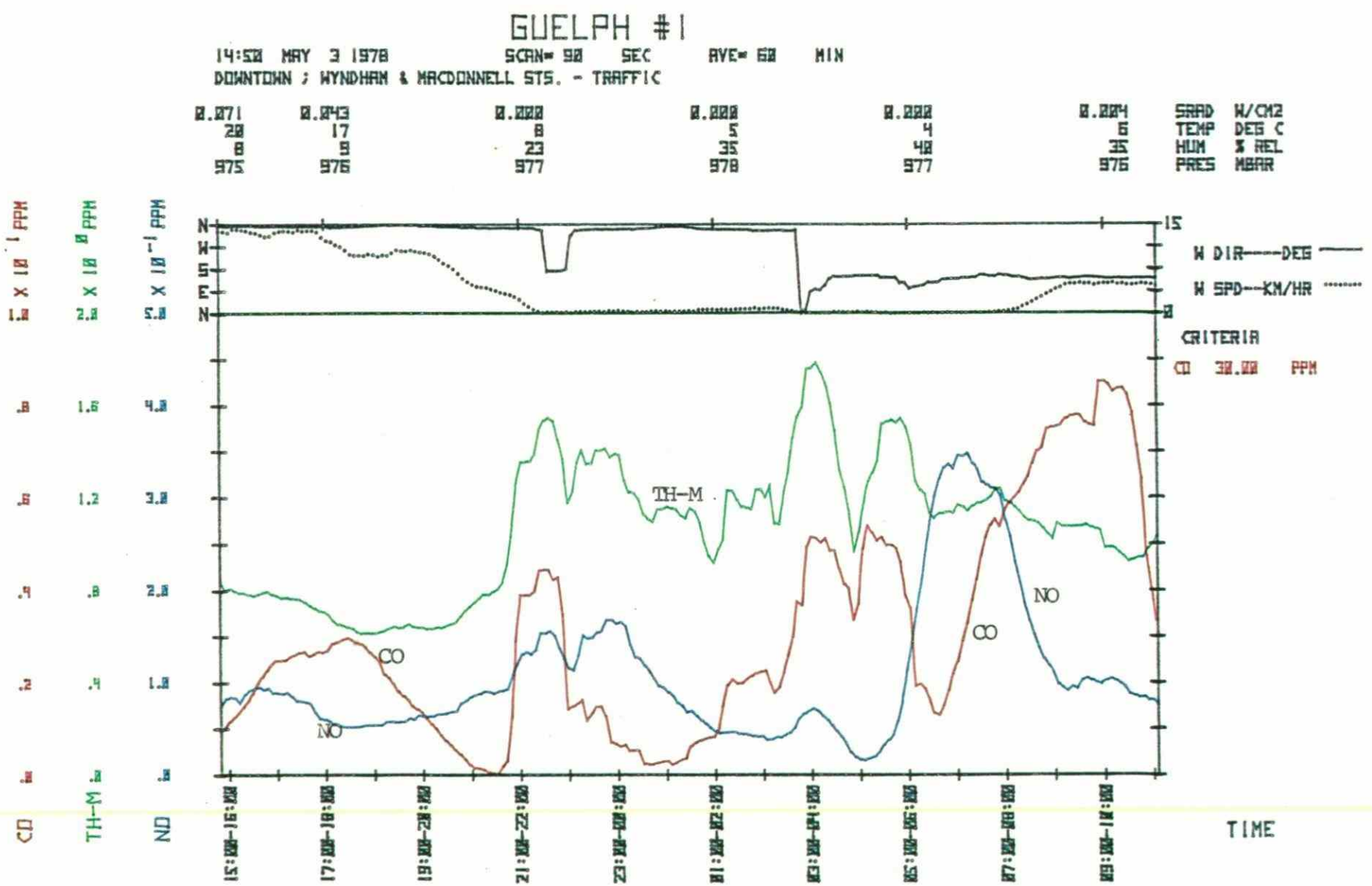
GROUND LEVEL CONCENTRATIONS IN THE VICINITY OF VEHICULAR TRAFFIC

MONITORING LOCATION / NUMBER	DATE 1978	MONITORING TIME START / END	INSTANTANEOUS CONCENTRATION				MAXIMUM 60-MINUTE AVERAGE CONCENTRATION		MONITORING PERIOD AVERAGE CONCENTRATION		SCAN TIME Min.
			Min.	Max.	Min.	Max.					
			CO		NO_X		CO	NO_X	CO	NO_X	
GUELPH #1	May 3	1450 - 1105	0.001	49.1	0.028	0.893	8.54	0.446	2.99	0.167	1.5
KITCHENER #1	May 4	1350 - 2305	0.001	84.7	0.001	0.258	17.5	0.096	6.61	0.067	1.5
			THC		NO		THC	NO	THC	NO	
GUELPH #1	May 3	1450 - 1105	1.41	9.04	0.004	0.615	3.40	0.344	2.24	0.105	1.5
KITCHENER #1	May 4	1350 - 2305	0.001	10.9	0.001	0.410	2.22	0.055	1.60	0.038	1.5
			$THC-CH_4$				$THC-CH_4$		$THC-CH_4$		
GUELPH #1	May 3	1450 - 1105	0.518	6.82			1.74		1.06		1.5
KITCHENER #1	May 4	1350 - 2305	0.001	4.65			0.882		0.661		1.5

COMMENTS; Electrical Power failure after 2100 hours during Kitchener Survey

Graph #1


GUELPH #1
14:50 MAY 3 1978 SCAN= 90 SEC AVE= 60 MIN
DOWNTOWN AT WYNDHAM & MACDONNELL; SOURCE - SQUARE/TRAFFIC
0.071 0.043 0.000 0.000 0.000 0.004 SRAD W/CM2
20 17 8 5 4 6 TEMP DEG C
8 9 23 35 40 35 HUM %_REL
975 976 977 978 977 976 PRES MBAR
CO X 10 ¹ PPM
THC X 10 ⁰ PPM
NOX X 10 ⁻¹ PPM
N W S E N
15
0
W DIR----DEG
W SPD---KM/HR
CRITERIA
CO 30.00 PPM
NOX 0.20 PPM
NOx
THC
8
CO
THC
NOX
15:00-16:00
17:00-18:00
19:00-20:00
21:00-22:00
23:00-00:00
01:00-02:00
03:00-04:00
05:00-06:00
07:00-08:00
09:00-10:00
TIME


GUELPH #1
14:50 MAY 3 1978 SCAN= 90 SEC AVE= 60 MIN
DOWNTOWN ; WYNDHAM & MACDONNELL STS. - TRAFFIC
0.071 0.043 0.000 0.000 0.000 0.004 SRAD W/CM2
20 17 8 5 4 6 TEMP DEG C
8 9 23 35 48 35 HUM % REL
975 976 977 978 977 976 PRES MBAR
N W S E N
15
0
W DIR----DEG
W SPD--KM/HR
CRITERIA
CO 30.00 PPM
CO X 10 -1 PPM
TH-M X 10 0 PPM
NO X 10 -1 PPM
CO
TH-M
NO
TIME

Graph #2

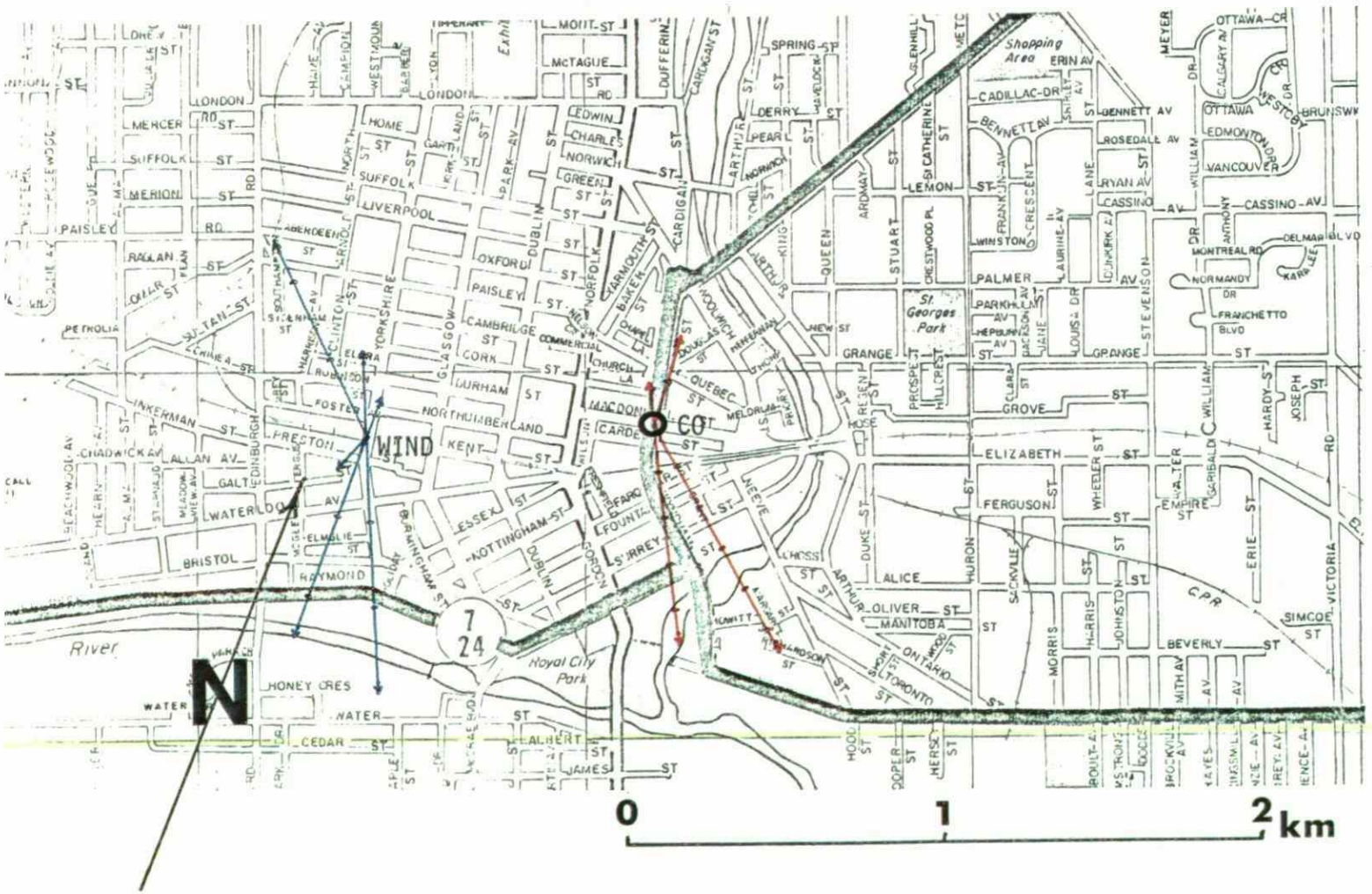
Rose #1

GUELPH #1

14:50 MAY 3 1978 SCAN= 90 SEC AVE= 60 MIN
LENGTH= 20.2 HRS MINIMUM MEAN= 1.000000E-03 PPM
DELAY= 0 MIN WIND RANGE= 0 / 15 KM/HR
LOC: DOWNTOWN ; WYNDHAM & MACDONNELL STS. - TRAFFIC

ARITHMETIC MEAN: CO
1 DIV= 1 PPM

PREVAILING WINDS; BLOWING TOWARDS:
1 DIV= 10 %

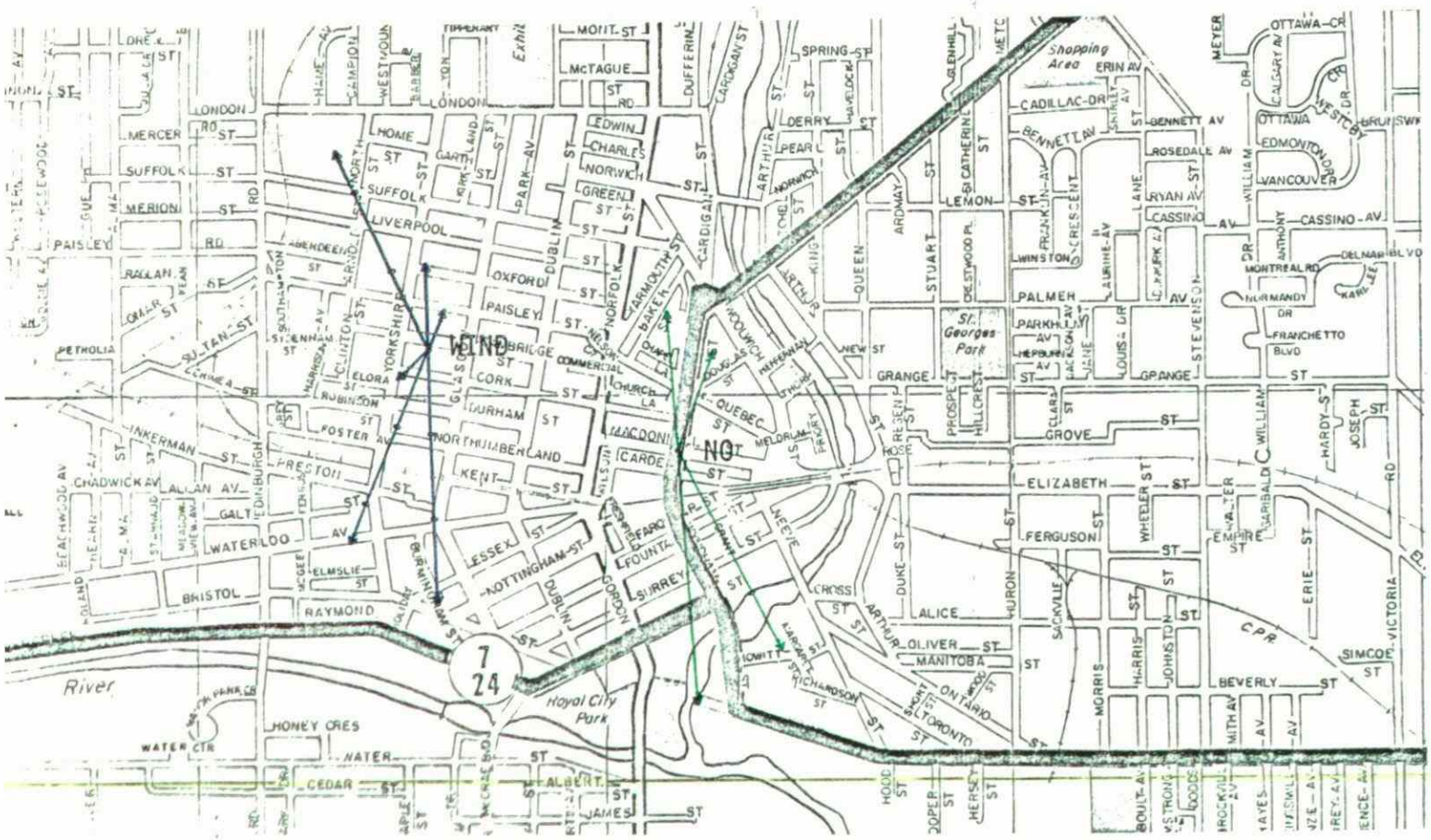


GUELPH #1

14:50 MAY 3 1978 SCAN= 30 SEC AVE= 60 MIN
LENGTH= 20.2 HRS MINIMUM MEAN= 1.000000E-03 PPM
DELAY= 0 MIN WIND RANGE= 0 , 25 KM/HR
LOC: DOWNTOWN ; WYNDHAM & MACDONNELL STS. - TRAFFIC

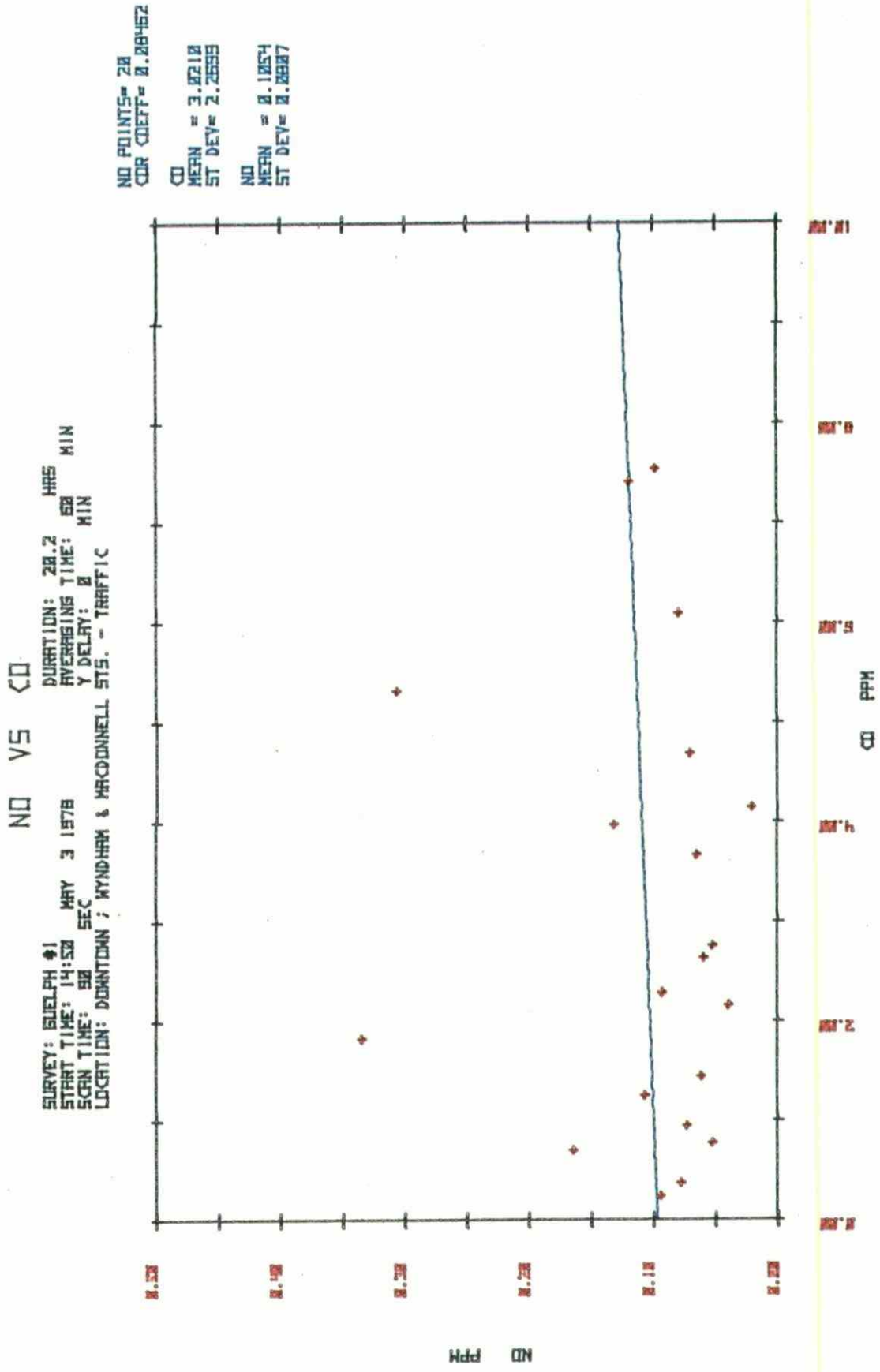
ARITHMETIC MEAN: ND
1 DIV= 0.1 PPM

PREVAILING WINDS; BLOWING TOWARDS:
1 DIV= 10 %



Rose #2

Graph #3

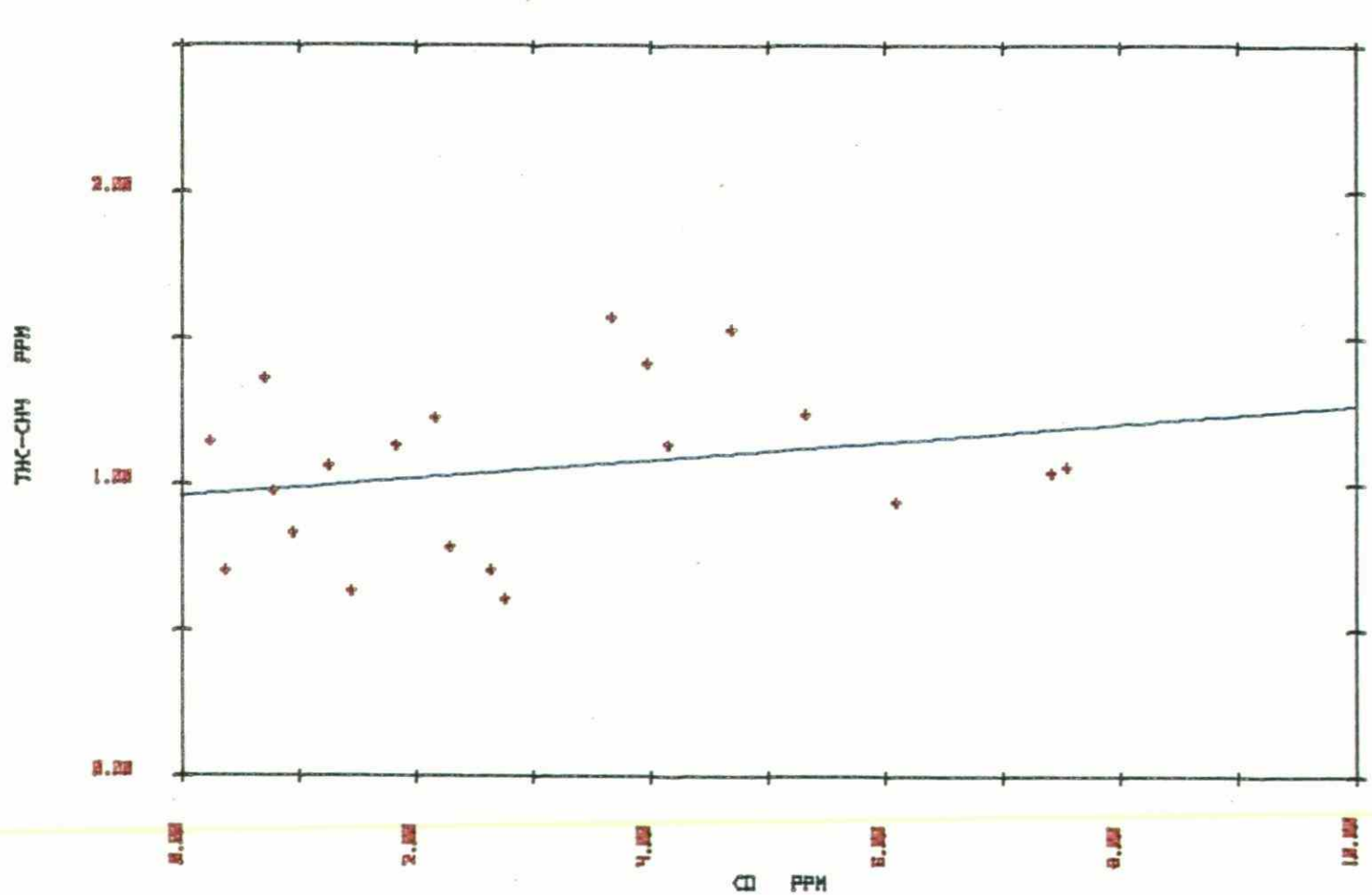

NO VS CO
SURVEY: GUELPH #1 MAY 3 1978
START TIME: 14:50 SEC
SCAN TIME: 90
LOCATION: DOWNTOWN / WYNDHAM & MACDONNELL STS. - TRAFFIC
DURATION: 20.2 HRS
AVERAGING TIME: 60 MIN
Y DELAY: 0 MIN
NO POINTS= 28
COR COEFF= 0.880452
CO
MEAN = 3.02210
ST DEV= 2.26599
NO
MEAN = 0.18574
ST DEV= 0.08007
NO PPM
CO PPM

Graph #4

THC-CH4 VS CO

SURVEY: GUELPH #1
START TIME: 14:52 MAY 3 1978
SCAN TIME: 90 SEC
LOCATION: DOWNTOWN ; WYNDHAM & MACDONNELL STS. - TRAFFIC

DURATION: 20.2 HRS
AVERAGING TIME: 60 MIN
Y DELAY: 0 MIN



NO POINTS= 20
COR COEFF= 0.24545

CO
MEAN = 3.0210
ST DEV= 2.2699

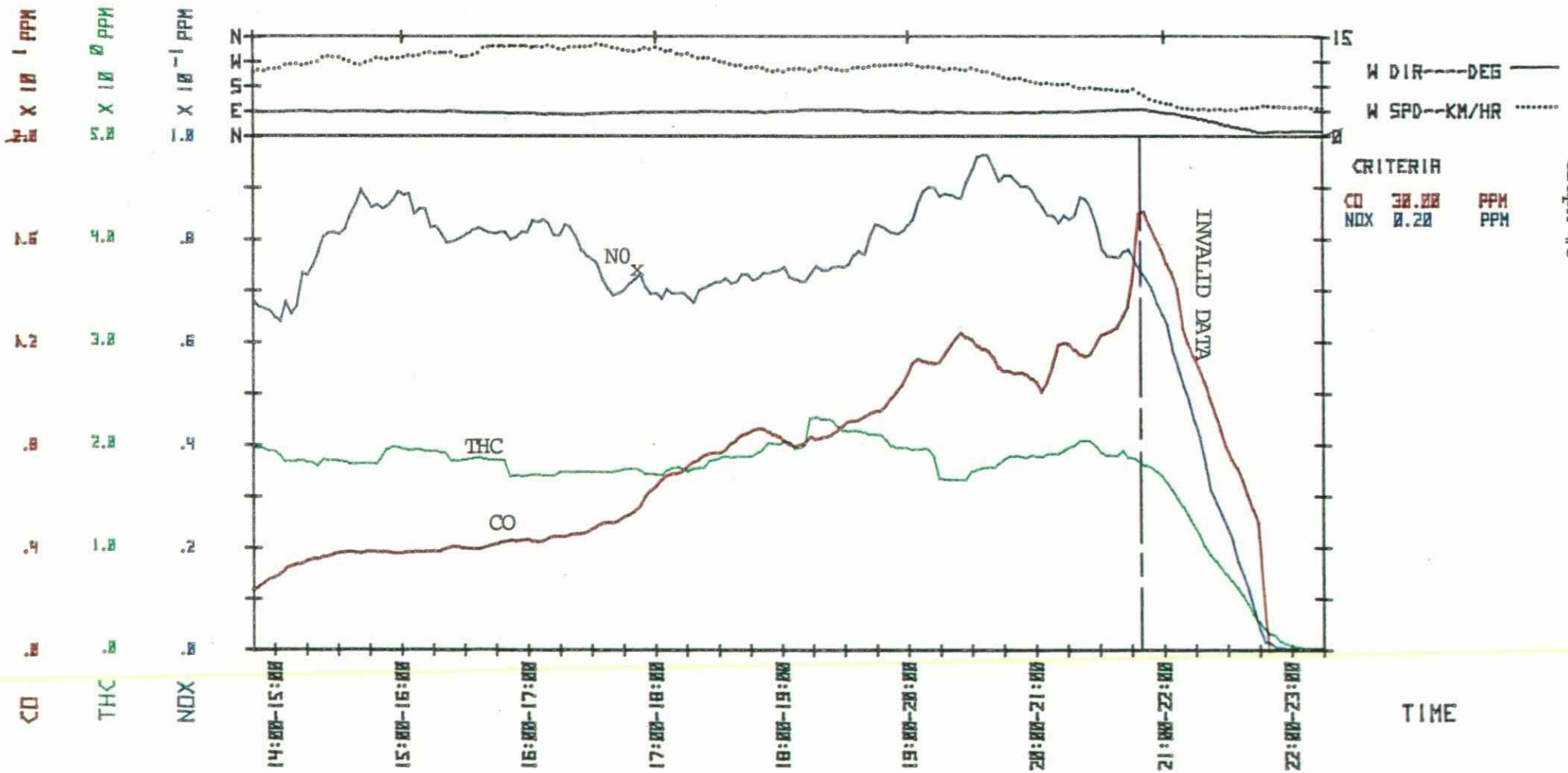
THC-CH4
MEAN = 1.0581
ST DEV= 0.2868

KITCHENER #1

13:50 MAY 4 1978 SCAN= 90 SEC AVE= 60 MIN

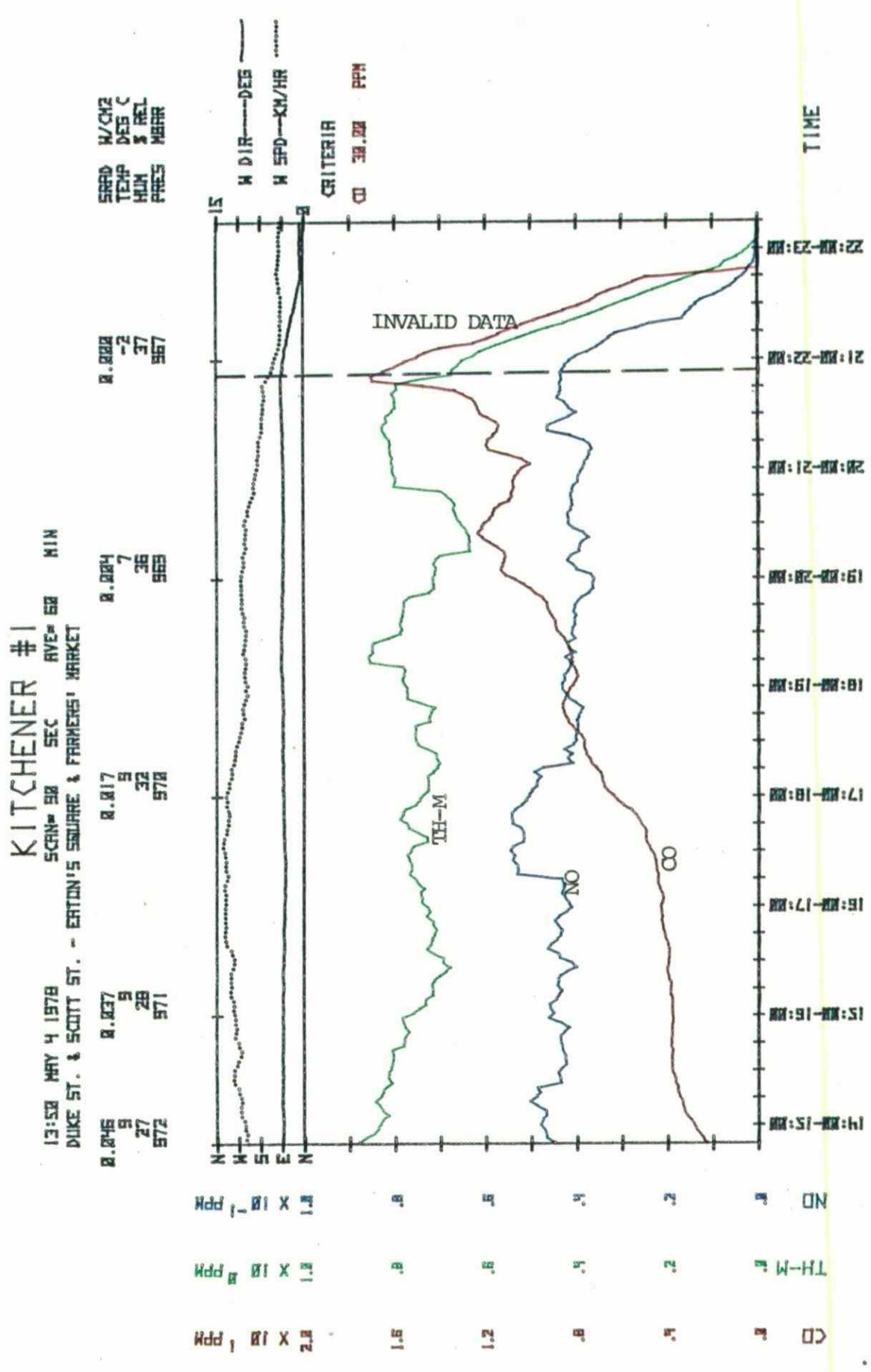
DUKE ST. & SCOTT ST.- EATON'S SQUARE & FARMERS' MARKET

0.046	0.007	0.017	0.004	0.000	SRAD W/CM2
9	9	9	7	-2	TEMP DEG C
27	28	32	36	37	HUM % REL
972	971	970	969	967	PRES MBAR



Graph #5

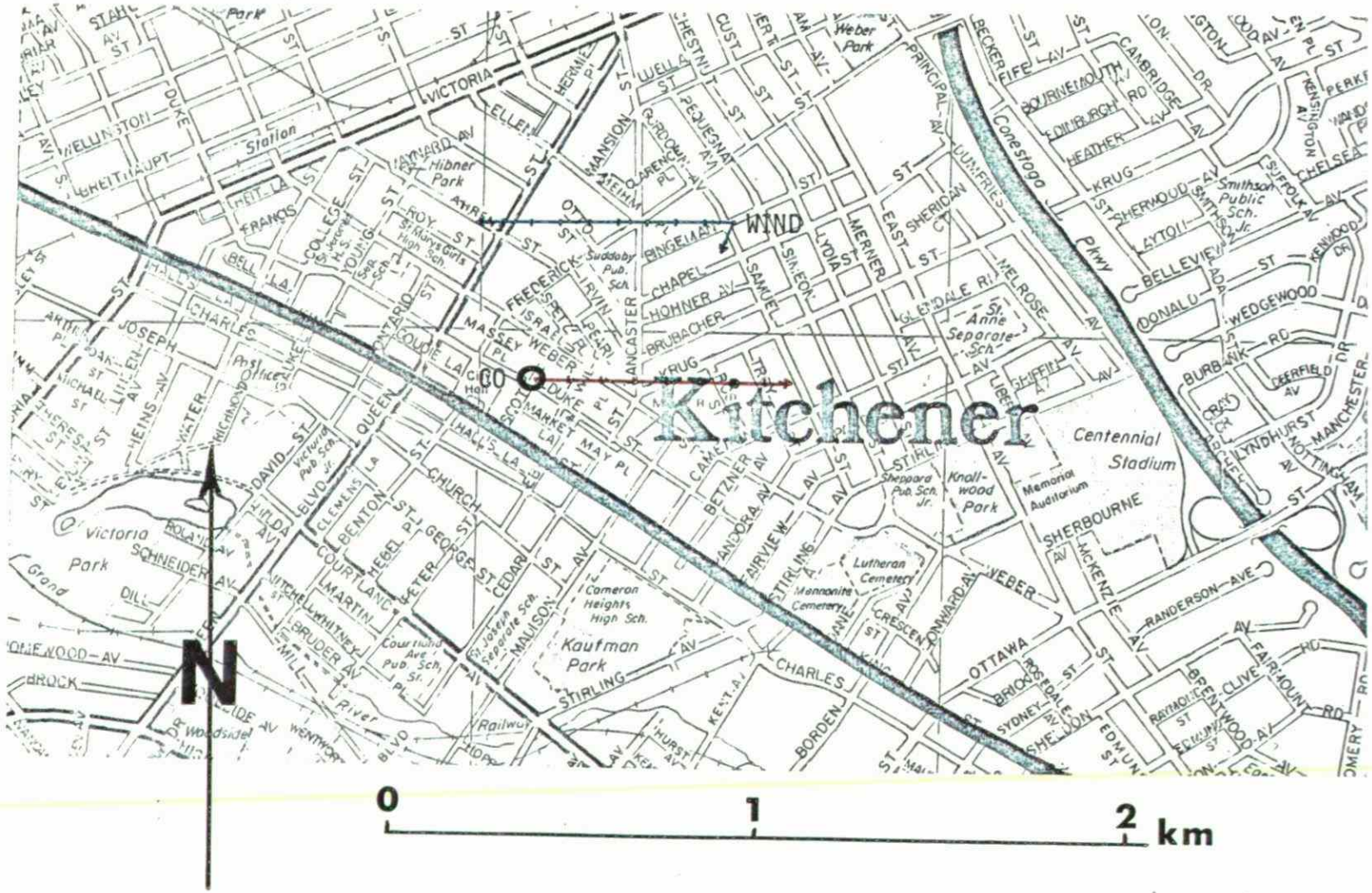
Graph #6


KITCHENER #1
13:53 MAY 4 1978
DUKE ST. & SCOTT ST. - EATON'S SQUARE & FARMERS' MARKET
SCAN= 90 SEC AVE= 60 MIN
SRAD W/CM2
TEMP DEG C
HUM % REL
PRES MBAR
W DIR——DEG
W SPD---KM/HR
CRITERIA
CO 30.00 PPM
INVALID DATA
TH-M
NO
O3
TIME
CO
TH-M
NO

KITCHENER #1

13:50 MAY 4 1978 SCAN= 90 SEC AVE= 60 MIN
LENGTH= 9.4 HRS MINIMUM MEAN= 1.000000E-03 PPM
DELAY= 0 MIN WIND RANGE= 0 , 20 KM/HR
LOC: DUKE ST. & SCOTT ST. - EATON'S SQUARE & FARMERS' MARKET

ARITHMETIC MEAN: CO
1 DIV= 1 PPM
PREVAILING WINDS; BLOWING TOWARDS:
1 DIV= 10 %



Rose #3

GUELPH #1

DATE: MAY 3 1978
SCAN TIME: 90 SEC
AVERAGING TIME: 60 MIN
LOCATION: DOWNTOWN ; WYNDHAM & MACDONNELL STS. - TRAFFIC

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
14:50----15:50	9.5E-01 8.4E-01 7.3E-02 975	2.0E-03 1.3E+00 7.1E-02 14	2.1E+00 1.4E-01 20 353	8.2E-03 6.6E-02 8
15:05----16:05	1.2E+00 8.0E-01 8.3E-02 975	1.0E-06 1.3E+00 6.6E-02 14	2.0E+00 1.3E-01 19 353	8.5E-03 5.2E-02 8
15:20----16:20	1.5E+00 7.8E-01 8.8E-02 975	1.0E-06 1.4E+00 6.5E-02 14	2.0E+00 1.4E-01 18 354	8.5E-03 5.6E-02 8
15:35----16:35	1.9E+00 7.8E-01 9.4E-02 975	1.0E-06 1.4E+00 6.0E-02 14	2.0E+00 1.5E-01 18 353	9.1E-03 5.8E-02 8
15:50----16:50	2.3E+00 7.9E-01 9.4E-02 975	1.0E-06 1.5E+00 6.1E-02 13	2.0E+00 1.5E-01 18 353	9.5E-03 6.1E-02 8
16:05----17:05	2.5E+00 7.6E-01 8.7E-02 975	1.0E-06 1.5E+00 5.9E-02 14	2.0E+00 1.5E-01 18 351	9.8E-03 6.6E-02 8
16:20----17:20	2.6E+00 7.6E-01 8.0E-02 975	1.0E-06 1.5E+00 5.5E-02 14	1.9E+00 1.4E-01 18 351	1.0E-02 6.4E-02 8
16:35----17:35	2.7E+00 7.4E-01 7.7E-02 975	1.0E-06 1.5E+00 5.0E-02 14	1.9E+00 1.4E-01 18 351	1.1E-02 6.9E-02 8
16:50----17:50	2.6E+00 7.1E-01 6.0E-02 975	1.0E-06 1.5E+00 4.6E-02 14	1.8E+00 1.2E-01 17 350	1.1E-02 7.1E-02 9
17:05----18:05	2.7E+00 6.9E-01 5.6E-02 976	1.0E-06 1.5E+00 4.1E-02 12	1.8E+00 1.2E-01 17 350	1.1E-02 6.5E-02 9

GUELPH #1, CONT'D

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
17:20----18:20	2.9E+00 6.5E-01 5.1E-02 976	1.0E-06 1.5E+00 3.7E-02 11	1.8E+00 1.0E-01 17 349	1.1E-02 5.5E-02 10
17:35----18:35	2.9E+00 6.3E-01 5.1E-02 976	1.0E-06 1.6E+00 3.2E-02 10	1.7E+00 1.0E-01 16 351	1.3E-02 5.4E-02 11
17:50----18:50	2.8E+00 6.1E-01 5.3E-02 976	1.0E-06 1.6E+00 2.4E-02 10	1.7E+00 1.0E-01 16 354	1.4E-02 5.0E-02 12
18:05----19:05	2.5E+00 6.2E-01 5.4E-02 976	1.0E-06 1.5E+00 1.7E-02 10	1.7E+00 1.0E-01 14 356	1.5E-02 5.4E-02 13
18:20----19:20	2.1E+00 6.3E-01 5.6E-02 976	1.0E-06 1.5E+00 1.1E-02 10	1.7E+00 1.1E-01 13 358	1.5E-02 6.0E-02 14
18:35----19:35	1.7E+00 6.4E-01 5.6E-02 976	1.0E-06 1.4E+00 5.4E-03 11	1.7E+00 1.0E-01 12 358	1.4E-02 5.6E-02 16
18:50----19:50	1.5E+00 6.4E-01 6.2E-02 976	1.0E-06 1.4E+00 4.5E-03 11	1.7E+00 1.1E-01 11 357	1.3E-02 5.6E-02 16
19:05----20:05	1.2E+00 6.3E-01 6.2E-02 976	1.0E-06 1.3E+00 3.4E-03 10	1.7E+00 1.1E-01 11 354	1.3E-02 5.4E-02 16
19:20----20:20	9.3E-01 6.4E-01 6.4E-02 977	1.0E-06 1.3E+00 2.3E-03 10	1.7E+00 1.1E-01 10 352	1.2E-02 5.2E-02 17
19:35----20:35	6.3E-01 6.5E-01 6.8E-02 977	1.0E-06 1.2E+00 1.4E-03 8	1.7E+00 1.1E-01 9 351	1.2E-02 5.0E-02 17
19:50----20:50	3.8E-01 7.1E-01 7.8E-02 977	1.0E-06 1.2E+00 6.1E-04 6	1.7E+00 1.2E-01 9 348	1.3E-02 4.5E-02 18

GUELPH #1, CONT'D

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
20:05----21:05	1.4E-01 7.5E-01 8.5E-02 977	1.0E-06 1.1E+00 1.9E-04 5	1.8E+00 1.3E-01 9 349	1.3E-02 4.9E-02 19
20:20----21:20	6.3E-02 7.8E-01 8.9E-02 976	1.0E-06 1.1E+00 4.1E-05 4	1.8E+00 1.3E-01 9 346	1.3E-02 4.4E-02 20
20:35----21:35	3.7E-03 8.1E-01 8.9E-02 976	1.0E-06 1.1E+00 4.5E-06 4	1.8E+00 1.4E-01 8 346	1.2E-02 5.4E-02 21
20:50----21:50	1.3E+00 1.1E+00 1.1E-01 976	1.0E-06 1.1E+00 1.2E-06 3	2.5E+00 1.6E-01 8 346	1.2E-02 6.6E-02 22
21:05----22:05	3.9E+00 1.4E+00 1.3E-01 977	1.0E-06 1.1E+00 1.4E-06 2	2.9E+00 1.9E-01 8 344	1.4E-02 6.6E-02 23
21:20----22:20	4.1E+00 1.4E+00 1.4E-01 977	1.0E-06 1.1E+00 1.5E-06 1	3.0E+00 2.1E-01 7 343	1.4E-02 8.1E-02 24
21:35----22:35	4.4E+00 1.5E+00 1.5E-01 978	1.0E-06 1.0E+00 1.5E-06 0	3.2E+00 2.3E-01 7 172	1.6E-02 7.9E-02 25
21:50----22:50	4.0E+00 1.4E+00 1.3E-01 978	1.0E-06 1.0E+00 1.5E-06 0	3.0E+00 2.1E-01 7 172	1.6E-02 7.2E-02 25
22:05----23:05	1.5E+00 1.2E+00 1.1E-01 978	1.0E-06 9.6E-01 2.7E-06 0	2.8E+00 2.0E-01 6 307	1.7E-02 8.7E-02 26
22:20----23:20	1.4E+00 1.4E+00 1.5E-01 978	1.0E-06 9.7E-01 3.6E-06 0	2.9E+00 2.4E-01 7 340	1.9E-02 8.9E-02 26
22:35----23:35	1.5E+00 1.4E+00 1.5E-01 978	1.0E-06 9.7E-01 3.6E-06 0	2.9E+00 2.5E-01 7 340	1.9E-02 9.8E-02 26

GUELPH #1, CONT'D

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
22:50----23:50	7.1E-01 1.4E+00 1.6E-01 978	1.0E-06 9.6E-01 3.7E-06 0	2.7E+00 2.6E-01 7 340	2.0E-02 9.9E-02 27
23:05----00:05	7.1E-01 1.4E+00 1.7E-01 978	1.0E-06 9.5E-01 2.4E-06 0	2.6E+00 2.5E-01 7 340	1.8E-02 9.3E-02 28
23:20----00:20	5.2E-01 1.2E+00 1.3E-01 978	1.0E-06 9.4E-01 1.5E-06 0	2.5E+00 2.1E-01 6 340	1.7E-02 7.7E-02 29
23:35----00:35	2.1E-01 1.1E+00 1.1E-01 978	1.0E-06 9.2E-01 2.7E-06 0	2.3E+00 1.8E-01 6 344	1.7E-02 7.3E-02 30
23:50----00:50	2.5E-01 1.1E+00 9.5E-02 978	1.0E-06 9.1E-01 3.0E-06 0	2.3E+00 1.7E-01 6 348	1.7E-02 7.5E-02 32
00:05----01:05	2.1E-01 1.2E+00 8.8E-02 978	1.0E-06 9.0E-01 3.4E-06 0	2.3E+00 1.5E-01 6 351	1.7E-02 6.9E-02 33
00:20----01:20	3.3E-01 1.1E+00 7.2E-02 978	1.0E-06 8.8E-01 3.6E-06 0	2.3E+00 1.3E-01 6 351	1.6E-02 6.8E-02 33
00:35----01:35	6.8E-01 1.1E+00 6.4E-02 978	1.0E-06 8.7E-01 2.5E-06 0	2.2E+00 1.2E-01 6 347	1.5E-02 7.0E-02 34
00:50----01:50	7.8E-01 9.8E-01 5.3E-02 978	1.0E-06 8.6E-01 2.6E-06 1	2.0E+00 9.8E-02 5 340	1.4E-02 5.7E-02 35
01:05----02:05	9.8E-01 9.8E-01 4.4E-02 978	1.0E-06 8.7E-01 2.3E-06 1	1.9E+00 8.7E-02 5 339	1.3E-02 5.2E-02 35
01:20----02:20	2.0E+00 1.2E+00 4.5E-02 978	1.0E-06 9.3E-01 2.0E-06 1	2.4E+00 8.7E-02 5 339	1.2E-02 4.9E-02 36

GUELPH #1, CONT'D

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
01:35----02:35	2.0E+00 1.2E+00 4.3E-02 977	1.0E-06 9.2E-01 2.0E-06 1	2.4E+00 7.6E-02 5 339	1.2E-02 3.8E-02 36
01:50----02:50	2.2E+00 1.2E+00 4.0E-02 977	1.0E-06 9.2E-01 2.6E-06 1	2.5E+00 7.1E-02 4 335	1.2E-02 3.7E-02 35
02:05----03:05	2.1E+00 1.2E+00 3.8E-02 977	1.0E-06 8.9E-01 2.8E-06 1	2.6E+00 7.3E-02 4 335	1.1E-02 4.2E-02 35
02:20----03:20	1.8E+00 1.1E+00 3.9E-02 977	1.0E-06 8.1E-01 3.5E-06 1	2.1E+00 7.6E-02 4 336	1.0E-02 4.7E-02 34
02:35----03:35	3.0E+00 1.4E+00 4.7E-02 977	1.0E-06 8.1E-01 3.3E-06 0	2.8E+00 9.3E-02 4 334	9.8E-03 5.3E-02 34
02:50----03:50	3.7E+00 1.6E+00 6.6E-02 977	1.0E-06 8.0E-01 2.2E-06 0	3.1E+00 1.2E-01 4 11	9.5E-03 6.0E-02 35
03:05----04:05	5.2E+00 1.7E+00 6.9E-02 977	1.0E-06 8.0E-01 2.0E-06 0	3.4E+00 1.2E-01 4 96	7.9E-03 5.5E-02 36
03:20----04:20	5.1E+00 1.7E+00 5.8E-02 977	1.0E-06 7.9E-01 3.1E-06 0	3.4E+00 1.0E-01 4 119	5.5E-03 4.3E-02 37
03:35----04:35	4.5E+00 1.3E+00 4.2E-02 977	1.0E-06 7.4E-01 5.5E-06 0	2.7E+00 8.2E-02 4 149	3.3E-03 4.1E-02 38
03:50----04:50	4.2E+00 1.1E+00 2.1E-02 977	1.0E-06 7.2E-01 7.5E-06 0	2.4E+00 5.4E-02 3 151	1.6E-03 3.5E-02 40
04:05----05:05	4.9E+00 1.2E+00 1.5E-02 977	1.0E-06 7.3E-01 8.8E-06 0	2.2E+00 5.2E-02 3 153	2.2E-03 4.3E-02 41

GUELPH #1, CONT'D

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
04:20----05:20	5.1E+00 1.3E+00 2.1E-02 977	1.0E-06 7.5E-01 7.4E-06 0	2.5E+00 6.5E-02 3 154	4.1E-03 5.1E-02 41
04:35----05:35	5.0E+00 1.5E+00 3.7E-02 977	1.0E-06 7.7E-01 6.0E-06 0	2.9E+00 8.6E-02 3 144	5.7E-03 5.5E-02 41
04:50----05:50	4.7E+00 1.5E+00 7.0E-02 977	1.0E-06 7.7E-01 4.8E-06 0	2.9E+00 1.3E-01 3 123	7.1E-03 6.8E-02 40
05:05----06:05	2.5E+00 1.4E+00 1.5E-01 977	1.0E-06 7.3E-01 2.2E-05 0	2.8E+00 2.3E-01 4 107	8.5E-03 8.7E-02 40
05:20----06:20	1.9E+00 1.2E+00 2.4E-01 977	1.0E-06 7.1E-01 9.3E-05 0	2.5E+00 3.3E-01 4 111	9.2E-03 9.6E-02 40
05:35----06:35	1.3E+00 1.1E+00 3.1E-01 977	1.0E-06 7.2E-01 2.6E-04 0	2.3E+00 4.1E-01 3 119	1.0E-02 9.8E-02 41
05:50----06:50	1.8E+00 1.1E+00 3.3E-01 977	1.0E-06 7.2E-01 5.1E-04 0	2.2E+00 4.5E-01 3 138	1.2E-02 9.8E-02 42
06:05----07:05	2.8E+00 1.2E+00 3.4E-01 977	1.0E-06 7.2E-01 9.5E-04 0	2.3E+00 4.4E-01 3 144	1.3E-02 8.2E-02 43
06:20----07:20	3.9E+00 1.2E+00 3.3E-01 977	1.0E-06 7.1E-01 1.6E-03 0	2.3E+00 4.3E-01 3 146	1.3E-02 7.9E-02 44
06:35----07:35	5.0E+00 1.2E+00 3.1E-01 977	1.0E-06 7.0E-01 2.2E-03 0	2.3E+00 4.2E-01 3 156	1.3E-02 8.9E-02 44
06:50----07:50	5.3E+00 1.2E+00 3.1E-01 977	1.0E-06 7.0E-01 2.8E-03 0	2.4E+00 4.3E-01 4 149	1.4E-02 1.1E-01 44

GUELPH #1, CONT'D

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
07:05----08:05	5.9E+00 1.2E+00 2.6E-01 977	1.0E-06 6.9E-01 3.1E-03 0	2.3E+00 3.7E-01 4 150	1.6E-02 1.1E-01 45
07:20----08:20	6.2E+00 1.1E+00 2.0E-01 977	1.0E-06 6.9E-01 3.1E-03 1	2.2E+00 3.0E-01 4 145	1.5E-02 1.1E-01 45
07:35----08:35	6.8E+00 1.1E+00 1.5E-01 977	1.0E-06 6.7E-01 3.1E-03 2	2.1E+00 2.4E-01 4 135	1.5E-02 9.6E-02 44
07:50----08:50	7.4E+00 1.0E+00 1.2E-01 977	1.0E-06 6.6E-01 3.1E-03 3	2.0E+00 1.8E-01 5 139	1.3E-02 7.0E-02 42
08:05----09:05	7.5E+00 1.1E+00 9.5E-02 977	1.0E-06 6.5E-01 3.3E-03 4	1.9E+00 1.5E-01 5 142	1.0E-02 6.1E-02 40
08:20----09:20	7.8E+00 1.1E+00 9.4E-02 976	1.0E-06 6.4E-01 3.5E-03 5	1.9E+00 1.4E-01 5 140	9.3E-03 5.2E-02 37
08:35----09:35	7.6E+00 1.1E+00 1.0E-01 976	1.0E-06 6.4E-01 3.8E-03 5	2.0E+00 1.4E-01 6 145	8.9E-03 4.8E-02 36
08:50----09:50	7.6E+00 1.1E+00 9.8E-02 976	1.0E-06 6.5E-01 4.0E-03 5	1.9E+00 1.5E-01 6 143	9.4E-03 5.4E-02 35
09:05----10:05	8.5E+00 9.8E-01 1.0E-01 976	1.0E-06 6.5E-01 4.5E-03 5	2.0E+00 1.6E-01 6 141	1.1E-02 6.6E-02 35
09:20----10:20	8.4E+00 9.6E-01 9.6E-02 976	1.0E-06 6.5E-01 1.8E-02 5	1.9E+00 1.6E-01 7 141	1.1E-02 6.3E-02 33
09:35----10:35	8.0E+00 9.3E-01 8.4E-02 976	1.0E-06 6.4E-01 3.5E-02 5	1.8E+00 1.5E-01 8 140	1.0E-02 6.5E-02 31

GUELPH #1, CONT'D PAGE 8

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
09:50----10:50	6.1E+00 9.4E-01 8.0E-02 976	1.0E-06 6.3E-01 5.2E-02 5	1.9E+00 1.5E-01 9 141	1.0E-02 6.7E-02 28
10:05----11:05	3.3E+00 1.0E+00 7.4E-02 976	1.0E-06 6.3E-01 7.1E-02 4	2.0E+00 1.4E-01 11 140	9.2E-03 6.6E-02 24

STATISTICS

NUMBER OF READINGS 810

POLLUTANT	MINIMUM VALUE	MAXIMUM VALUE	ARITHMETIC MEAN	STANDARD DEVIATION	GEOMETRIC MEAN	GEOMETRIC STD. DEV.
CO	1.00E-06	4.91E+01	2.99E+00	4.38E+00	2.23E-01	1.88E+02
H2S	1.00E-06	1.98E-02	1.01E-04	1.13E-03	1.09E-06	2.43E+00
THC	1.41E+00	9.04E+00	2.24E+00	1.05E+00	2.10E+00	1.38E+00
SO2	1.00E-06	3.11E-02	1.17E-02	4.60E-03	9.64E-03	3.07E+00
THC-CH4	5.18E-01	6.82E+00	1.06E+00	6.46E-01	9.59E-01	1.49E+00
CH4	5.91E-01	1.58E+00	9.83E-01	3.11E-01	9.37E-01	1.36E+00
NOX	2.78E-02	8.93E-01	1.67E-01	1.23E-01	1.34E-01	1.93E+00
NO2	1.00E-06	5.92E-01	6.59E-02	5.91E-02	2.37E-02	1.94E+01
NO	3.50E-03	6.15E-01	1.05E-01	9.84E-02	7.18E-02	2.45E+00
SOLAR RAD	1.00E-06	9.12E-02	1.43E-02	2.55E-02	1.84E-04	8.19E+01
TEMP	3	21	8	5		
HUMIDITY	6	46	28	12	24	2
BAROMETER	975	978	977	1	977	1
WIND SPEED	0	22	4	5	1	24

	MAXIMUM AVERAGE
CO	8.54E+00
H2S	2.02E-03
THC	3.40E+00
SO2	1.97E-02
THC-CH4	1.74E+00
CH4	1.55E+00
NOX	4.46E-01
NO2	1.09E-01
NO	3.44E-01
SOLAR RAD	7.07E-02
TEMP	20
HUMIDITY	45
BAROMETER	978
WIND SPEED	14
WIND DIRECTION	358

KITCHENER #1

DATE: MAY 4 1978
SCAN TIME: 90 SEC
AVERAGING TIME: 60 MIN
LOCATION: DUKE ST. & SCOTT ST. - EATON'S SQUARE & FARMERS' MARKET

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
13:50----14:50	2.3E+00 8.8E-01 4.5E-02 972	1.3E-02 1.1E+00 4.6E-02 10	2.0E+00 6.8E-02 9 88	8.9E-03 3.2E-02 27
14:05----15:05	3.2E+00 8.2E-01 4.7E-02 972	6.9E-03 1.1E+00 4.4E-02 11	1.8E+00 6.8E-02 9 88	6.7E-03 3.2E-02 27
14:20----15:20	3.5E+00 8.3E-01 4.9E-02 972	2.3E-03 1.1E+00 4.2E-02 11	1.8E+00 7.7E-02 9 90	6.1E-03 4.0E-02 27
14:35----15:35	3.9E+00 8.1E-01 4.3E-02 971	8.8E-04 1.1E+00 4.0E-02 11	1.8E+00 8.4E-02 9 90	6.0E-03 4.7E-02 27
14:50----15:50	3.9E+00 7.7E-01 4.4E-02 971	3.6E-04 1.2E+00 3.8E-02 12	1.8E+00 8.6E-02 9 89	6.6E-03 4.8E-02 27
15:05----16:05	3.9E+00 7.5E-01 4.6E-02 971	1.8E-04 1.2E+00 3.7E-02 12	1.9E+00 8.5E-02 9 89	8.9E-03 4.4E-02 28
15:20----16:20	4.0E+00 7.1E-01 4.4E-02 971	2.4E-04 1.2E+00 3.5E-02 13	1.9E+00 8.0E-02 9 89	1.4E-02 4.1E-02 28
15:35----16:35	3.9E+00 7.3E-01 4.6E-02 970	3.0E-04 1.2E+00 3.1E-02 12	1.9E+00 8.2E-02 9 84	1.9E-02 4.4E-02 29
15:50----16:50	4.3E+00 7.2E-01 4.5E-02 970	2.6E-04 1.2E+00 2.6E-02 14	1.8E+00 8.1E-02 9 83	2.2E-02 4.4E-02 30
16:05----17:05	4.2E+00 7.4E-01 4.3E-02 970	2.9E-04 1.2E+00 2.1E-02 14	1.7E+00 8.3E-02 9 80	2.3E-02 4.7E-02 30

KITCHENER #1, CONT'D

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
16:20----17:20	4.5E+00 7.7E-01 5.3E-02 970	2.2E-04 1.2E+00 1.9E-02 13	1.7E+00 8.2E-02 9 79	2.0E-02 4.0E-02 30
16:35----17:35	5.0E+00 7.3E-01 5.2E-02 970	1.6E-04 1.2E+00 1.9E-02 14	1.7E+00 7.2E-02 9 84	1.6E-02 3.1E-02 31
16:50----17:50	5.4E+00 7.8E-01 5.5E-02 970	1.3E-04 1.2E+00 1.8E-02 13	1.7E+00 7.2E-02 9 86	1.4E-02 2.7E-02 31
17:05----18:05	6.8E+00 7.3E-01 4.9E-02 970	1.5E-04 1.2E+00 1.6E-02 13	1.7E+00 7.0E-02 8 88	1.3E-02 3.2E-02 32
17:20----18:20	7.4E+00 7.1E-01 4.2E-02 969	2.2E-04 1.2E+00 1.5E-02 12	1.8E+00 7.0E-02 8 89	1.2E-02 3.2E-02 32
17:35----18:35	7.9E+00 7.6E-01 4.0E-02 969	2.3E-04 1.2E+00 1.3E-02 11	1.9E+00 7.2E-02 8 88	9.5E-03 3.5E-02 33
17:50----18:50	8.7E+00 7.2E-01 3.9E-02 969	2.6E-04 1.1E+00 1.2E-02 10	1.9E+00 7.3E-02 8 87	7.3E-03 4.0E-02 34
18:05----19:05	8.0E+00 7.9E-01 4.3E-02 969	1.9E-04 1.1E+00 9.9E-03 10	2.0E+00 7.2E-02 8 92	5.5E-03 3.3E-02 34
18:20----19:20	8.3E+00 8.5E-01 4.1E-02 970	1.0E-04 1.1E+00 8.2E-03 11	2.2E+00 7.4E-02 8 94	4.8E-03 4.0E-02 35
18:35----19:35	9.0E+00 7.9E-01 4.1E-02 970	1.1E-04 1.1E+00 6.5E-03 10	2.1E+00 7.7E-02 8 92	4.7E-03 4.4E-02 35
18:50----19:50	9.5E+00 7.7E-01 3.9E-02 969	1.1E-04 1.1E+00 4.9E-03 11	2.0E+00 8.2E-02 7 91	4.8E-03 4.9E-02 36

KITCHENER #1, CONT'D PAGE 3

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
19:05----20:05	1.1E+01 7.1E-01 4.0E-02 969	2.8E-04 1.1E+00 3.6E-03 11	1.9E+00 8.7E-02 7 87	4.5E-03 5.5E-02 37
19:20----20:20	1.2E+01 6.4E-01 3.9E-02 969	3.5E-04 1.1E+00 2.4E-03 10	1.6E+00 8.9E-02 7 87	4.5E-03 5.3E-02 37
19:35----20:35	1.2E+01 6.7E-01 4.2E-02 969	4.0E-04 1.1E+00 1.4E-03 10	1.8E+00 9.6E-02 7 85	4.1E-03 5.5E-02 38
19:50----20:50	1.1E+01 8.0E-01 4.1E-02 969	3.3E-04 1.1E+00 6.5E-04 9	1.9E+00 9.2E-02 7 85	4.1E-03 5.2E-02 38
20:05----21:05	1.0E+01 8.1E-01 3.8E-02 969	1.6E-04 1.1E+00 2.4E-04 8	1.9E+00 8.5E-02 6 87	4.6E-03 4.8E-02 39
20:20----21:20	1.2E+01 8.3E-01 4.2E-02 969	8.7E-05 1.0E+00 7.2E-05 7	2.0E+00 8.6E-02 6 89	5.7E-03 4.8E-02 40
20:35----21:35	1.2E+01 8.0E-01 4.3E-02 969	5.0E-05 1.0E+00 2.9E-05 7	1.9E+00 7.7E-02 6 93	6.2E-03 4.3E-02 42
20:50----21:50	1.7E+01 6.9E-01 4.4E-02 970	5.7E-05 9.7E-01 2.5E-05 6	1.8E+00 7.3E-02 5 95	6.7E-03 3.8E-02 44
21:05----22:05	1.5E+01 6.1E-01 3.7E-02 966	5.7E-05 7.2E-01 2.3E-05 5	1.5E+00 5.7E-02 -5 79	7.3E-03 2.8E-02 34
21:20----22:20	1.0E+01 4.3E-01 2.4E-02 961	5.1E-05 4.7E-01 2.6E-05 4	9.7E-01 3.5E-02 -16 56	4.9E-03 1.7E-02 23
21:35----22:35	7.1E+00 2.6E-01 9.8E-03 956	1.2E-05 2.3E-01 2.8E-05 4	5.9E-01 1.7E-02 -28 29	3.6E-03 8.5E-03 12

KITCHENER #1, CONT'D PAGE 4

TIME	CO THC-CH4 NO BAROMETER	H2S CH4 SOLAR RAD WIND SPEED	THC NOX TEMP WIND DIRECTION	SO2 NO2 HUMIDITY
21:50----22:50	1.1E-04 8.4E-02 2.1E-03 950	1.0E-06 4.4E-04 3.1E-05 5	1.4E-01 1.3E-03 -39 14	2.0E-03 1.7E-04 0
22:05----23:05	1.1E-04 8.0E-06 6.6E-04 950	1.0E-06 3.7E-05 3.7E-05 4	3.9E-05 1.4E-06 -40 16	1.1E-06 1.3E-06 0

STATISTICS

NUMBER OF READINGS 377

POLLUTANT	MINIMUM VALUE	MAXIMUM VALUE	ARITHMETIC MEAN	STANDARD DEVIATION	GEOMETRIC MEAN	GEOMETRIC STD. DEV.
CO	1.00E-06	8.47E+01	6.61E+00	7.47E+00	4.56E-01	3.57E+02
H2S	1.00E-06	2.80E-02	1.54E-03	5.06E-03	1.63E-05	3.21E+01
THC	1.00E-06	1.09E+01	1.60E+00	9.82E-01	2.64E-01	1.29E+02
SO2	1.00E-06	4.73E-02	8.20E-03	7.25E-03	2.10E-03	2.51E+01
THC-CH4	1.00E-06	4.65E+00	6.61E-01	4.21E-01	1.24E-01	9.45E+01
CH4	1.00E-06	1.86E+00	9.57E-01	4.14E-01	1.40E-01	1.43E+02
NOX	1.00E-06	2.58E-01	6.66E-02	4.17E-02	1.43E-02	5.15E+01
NO2	1.00E-06	2.45E-01	3.50E-02	3.63E-02	2.39E-03	1.04E+02
NO	1.00E-06	4.10E-01	3.75E-02	3.73E-02	1.83E-02	6.69E+00
SOLAR RAD	1.00E-06	5.28E-02	1.54E-02	1.67E-02	2.20E-03	2.09E+01
TEMP	-42	10	1	17		
HUMIDITY	0	47	28	13	7	48
BAROMETER	943	991	967	8	967	1
WIND SPEED	1	24	10	5	9	2

	MAXIMUM AVERAGE
CO	1.75E+01
H2S	1.30E-02
THC	2.22E+00
SO2	2.30E-02
THC-CH4	8.82E-01
CH4	1.22E+00
NOX	9.63E-02
NO2	5.54E-02
NO	5.49E-02
SOLAR RAD	4.60E-02
TEMP	9
HUMIDITY	44
BAROMETER	972
WIND SPEED	14
WIND DIRECTION	95